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Six Ways to Prevent Your Lift Trucks from Starting a Fire

09/14/11

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Introduction

If you use powered lift trucks in your warehouse, as most warehouse operators do, there is a chance that someday one of them will start a fire in your facility. Are you prepared for that? Are you doing what you can now to prevent it?

The National Fire Protection Association reports that between the years 2003 and 2006, fire departments in the United States responded to an estimated total of 1,340 fires in which industrial lift trucks were directly involved in the ignition (National Fire Protection Association, Jan 2009).

A propane-powered lift truck being driven to the maintenance department at one of our client's facilities leaked propane gas into the engine compartment, leading to an explosion and fire. Several workers in the area extinguished the flames with portable fire extinguishers and were then able to close the fuel supply valve. Fortunately, no one was injured and the fire did not spread. It was later discovered that the fuel line was in contact with a bolt head on the framework and normal vibrations had worn a hole in the line at the point of contact.

Here are 6 things you can and should be doing to make sure your lift trucks do not become a serious fire risk.

1. Perform Preventive Maintenance Properly

Both fuel-powered trucks and electric-powered trucks require routine preventive maintenance. The maintenance should be timely, thorough and in strict accordance with the manufacturer's published requirements. The maintenance work should be performed by trained and experienced personnel. If thorough maintenance is not done in a timely and quality manner, the risk of a fire goes way up.



In Wisconsin, a fire in a cold storage warehouse grew out of control, and eventually the building collapsed (NFPA, Jan 2009). The fire was started by an electrical malfunction on an electric-powered lift truck. Workers attempted to extinguish the fire with portable fire extinguishers but were unsuccessful. The fire spread from the burning lift truck to nearby combustible storage, and then grew rapidly out of control.

In a California warehouse, a brittle fuel line on a gasoline-powered lift truck broke, spraying gasoline onto the hot engine manifold where it ignited (NFPA, Jan 2009). The lift truck operator jumped off of the lift truck, retrieved a portable fire extinguisher and discharged it onto the burning lift truck. The quick action of the operator, plus two automatic sprinklers that fused overhead, effectively extinguished the fire. Damage was confined to the lift truck, and was minor. The operator was treated for minor burns to one arm.

2. Train Lift Truck Operators About Fire Risk and Prevention



Most lift truck operators are unaware that their lift truck could start a fire. Give them training about this risk so that can be always alert and prepared. Armed with the right knowledge, they are more likely to make the right decisions.

The Occupational Safety & Health Administration provides detailed requirements for operator training regarding the safe operation of lift trucks (Occupational Safety & Health Administration, 3 Apr 2006).

Comprehensive training should be given to each lift truck operator that covers the lift truck, workplace, and OSHA lift truck safety requirements. Each operator should also receive refresher training once every 3 years, or when:

- The operator has been observed operating a lift truck in an unsafe manner;
- The operator has been involved in an accident or near-miss incident;
- The operator is assigned to a different type of lift truck;
- A condition in the workplace changes that could affect safe operation of the lift truck

In Iowa, at a paper products manufacturing plant, a lift truck driver forgot to release the parking brake fully (NFPA, Jan 2009). The parking brake overheated as the truck was operated, and eventually ignited combustible material underneath the brake. A few minutes later, the LP-gas tank exploded catching adjacent storage of rolled paper on fire. The fire destroyed the building, and about 3,500 tons of rolled paper.

At a New Jersey carpet pad manufacturing plant, a lift truck operator back his propane-powered truck up against a pile of polyurethane foam buns and left it parked there (NFPA, Jan 2009). A short time later, the hot exhaust manifold ignited the polyurethane foam. The plant's fire brigade and the public fire department fought the fire for 1-1/2 hours, which damaged 220 buns before it was extinguished.

At a recycling facility in New Jersey, a lift truck operator backed his propane-powered truck into a steel building column (NFPA, Jan 2009). The fuel line

immediately ruptured, releasing propane, which ignited engulfing the lift truck. The fire was limited to the lift truck and was extinguished by the public fire department. The lift truck operator was injured while escaping from the burning truck.

The Labor Institute (Jul 2009) has compiled an excellent [health and safety awareness training program](#), which divides the training into 7 activities, listed below. A safety inspection form for lift trucks is also included as Appendix A of this program.

1. Hazards of Powered Industrial Trucks
2. Mapping Hazards at Work
3. Systems of Safety
4. Identifying Near Misses
5. Incident Investigation Using the Logic Tree
6. Lessons Learned
7. The OSHA Standard, 1910.178, Powered Industrial Trucks.

3. Keep Lift Trucks Clean

As lift trucks travel through a facility day after day, they get dirty. They pick up debris from their environment, commonly including corrugated paper dust and bits of torn paper and plastic shrink wrap material. Particulate from rubber tires, brake fluid, lubrication oil and grease, also collect on the truck. These various ingredients are a recipe for combustible residue build-up, especially under the truck body, and if not cleaned regularly, with form a thick and ignitable layer.



At a warehouse storing baled scrap paper and plastic material, a lift truck caught fire while moving a bale of scrap paper (NFPA, Jan 2009). Investigators believe that a piece of scrap paper became stuck in the lift truck, which caused the truck

to overheat and ignite the paper. The fire spread to the baled paper being transported by the truck, and then spread to the storage of baled paper and plastic surrounding the truck. This fire caused approximately \$45 million in damage.

4. Follow Precautions in Hazardous Areas



Lift trucks are power-driven machines. The power systems, including electrical power from batteries and fuel-power such as propane, create energy which, under certain conditions, can ignite flammable or explosive materials in hazardous areas.

National Fire Protection Association (2011a) groups hazardous areas into several classifications. Class I covers flammable gases or vapors. Class II covers combustible dusts. Class III covers easily ignitable fibers, such as cotton. Powered lift trucks should be listed or approved for the specific area classification in which they will be used. Lift trucks are given one of 11 designations to help you make sure

the right truck is being used in a given area and are listed below.

1. **D.** Diesel powered units with minimal acceptable safeguards against inherent fire hazards.
2. **DS.** Diesel powered units with additional safeguards to the exhaust, fuel, and electrical systems.
3. **DY.** Diesel powered units that have all the safeguards of DS units, plus do not have any electrical equipment including the ignition. They have temperature limitation features.
4. **E.** Electrically powered units with minimal acceptable safeguards against inherent fire hazards.
5. **ES.** Electrically powered units with additional safeguards to the electrical system to prevent emission of hazardous sparks and to limit surface temperatures.
6. **EE.** Electrically powered units that have all the safeguards of the E and ES units, plus the electric motor and all other electrical equipment are completely enclosed.

7. **EX.** Electrically powered units with electrical fittings and equipment designed, constructed, and assembled so that the units can be used in certain atmospheres containing flammable vapors or dusts.
8. **G.** Gasoline powered units with minimal acceptable safeguards against inherent fire hazards.
9. **GS.** Gasoline powered units with additional safeguards to the exhaust, fuel, and electrical systems.
10. **LP.** Liquefied petroleum gas units with minimal acceptable safeguards against inherent fire hazards.
11. **LPS.** Liquefied petroleum gas units with additional safeguards to the exhaust, fuel, and electrical systems.

At a paint manufacturing plant in California, a sudden explosion and fire killed one worker and injured 3 others (NFPA, Jan 2009). Officials believe the explosion and fire occurred when a spark from the forklift ignited flammable vapors escaping from open 55-gallon drums of solvent. The forklift's manufacturer characterized the vehicle as not rated for use in flammable vapor atmospheres. In addition, there was open and exposed wiring on the housing of the forklift's steering wheel.

5. Stop Reckless Driving Behavior

Reckless driving behavior is a major cause of accidents that lead to ignitions and serious fires. Reckless driving often results in a lift truck coming into contact with other objects, including other lift trucks, building support columns, gas lines, electrical conduit and panels, storage racks, and stored goods. These contacts can be gentle or forceful, but in either case may lead directly to fire ignition.



I performed a fire risk survey at a cotton bale warehouse at a textile factory and observed several roof support columns that had been knocked off of their foundations by reckless lift truck drivers. I discussed this with the plant manager, who was in a state of despair over the situation. He could not find out which drivers were causing the damage because the drivers protected each other. This was before the proliferation of affordable surveillance cameras. I sympathized, but encourage him to find a solution. During my next visit, the columns had been repaired and it was apparent the reckless driving behavior had been eliminated. I asked the plant manager how he had accomplished this miraculous transformation in such a short period of time. His answer was astonishingly simple and effective. The crew of lift truck drivers was assembled and told that their trucks were going to be cleaned up and given a new coat of paint. The drivers were asked to choose their color, any color they wanted, as long as no two trucks were the same color. The drivers were excited and morale was boosted immediately. All trucks were then painted. Within a few days all reckless driving and related damage ceased. Each time a driver impacted an object, his paint color was left behind incriminating him. The drivers could no longer protect each other, so they had no choice but to drive carefully.

At a recycling facility in New Jersey, a lift truck driver backed up and rammed a building structural column (NFPA, Jan 2009). The impact ruptured the lift trucks propane fuel line, releasing propane gas. The gas ignited, probably by the hot lift truck exhaust system parts, and the resulting fire consumed the lift truck. The lift truck driver was injured in the process of escaping from his burning truck. The overhead sprinkler system operated automatically and confined the fire to the burning truck.

At a rolled-paper warehouse in South Carolina, a lift truck driver collided with a stack of rolled-paper (NFPA, Jan 2009), ripping away the valve assembly on the propane tank. Escaping propane gas was ignited by the hot lift truck engine components, engulfing the truck in a fire ball. The heat from the fire operated 31 ceiling sprinklers, which helped to confine the spread of the fire until the public fire department could accomplish extinguishment. The fire damaged or destroyed 600 tons of rolled paper.

6. Protect Battery Cables from Damage & Replace When Damaged



Electric-powered lift trucks present a potential fire risk in the form of battery cables between the on-board battery and the truck's drive systems. There are many different truck designs. Some of the designs provide protection for the battery cables by neatly securing them inside the frame of the truck. See **Photo No. 1** for an example. Other truck designs allow the battery cables to extend outside of the truck frame exposing them to impact damage. See **Photo No. 2** for an example.

If the cables extend outside of the truck frame, it can become pinched between the truck frame and other objects in the environment, such as a building column or a storage rack upright support member. Then, as the truck moves, the insulation on the cables can be stripped off allowing the bare cables to contact the metal structural member, causing a dead short. This risk can be reduced or eliminated by covering the battery cables with a protective sleeve, or by installing retainer clips that will hold the cables inside of the truck frame. See **Photo No. 3** for an example of the protective sleeve solution.



At a client's large distribution center, a lift truck driver placed a pallet load in a storage rack's upper tier, and began pulling back. The battery cable became pinched between the truck's frame and a rack steel upright structural member. The cable insulation was peeled back and the bare cable shorted to the steel upright member. The dead short immediately caused the lift truck battery to explode and burn. Fortunately, no one was injured and the fire was extinguished with several portable fire extinguishers. Also fortunately, the rack bays surrounding the immediate area of the lift truck were empty, so the fire could not spread to combustible storage in the racks.

Conclusion

Powered lift trucks present a significant fire risk to any facility in which they operate. A powered lift truck is a package that combines heat sources and combustible materials together in close quarters. History shows that it does not take much to bring the heat sources and combustible materials together, leading to a costly fire that is disruptive to operations and puts personnel at risk of injury. Learn and follow the 6 tactics in this paper and you will greatly reduce the chance of a fire starting in your powered lift trucks.

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About Harrington Group, Inc.:

Harrington Group, Inc. is a Fire Protection consulting engineering firm headquartered in Duluth, GA, with an additional office in Charlotte, NC (d/b/a HGI, Inc.). The firm specializes in Fire Protection System Design and Forensic Fire Engineering, and Property Loss Control Consulting. Harrington Group is committed to providing its clients with creative solutions, while optimizing the relationship between cost and benefits. Established in 1986 by Jeffrey L. Harrington, P.E., FSFPE, the firm has become one of the most experienced and respected practices dedicated to Fire Protection in the southeast. For more information, please visit www.hgi-fire.com or find us here:

